Remarks

The paragraph beginning on line 14 of page 5 of the specification is currently amended to reflect the filing dates and correspondingly assigned serial numbers of each of the mentioned patent applications. The paragraph beginning on line 30 of page 8 of the specification is currently amended to correct the typographical error that incorrectly referred to FIG. 1 instead of FIG. 3.

Claims 1-20 were originally filed in this application.

No claims have been canceled. No new claims are added.

Independent claim 5 is currently amended to correct a typographical error. Independent claim 11 is currently amended to place the recited species into proper Markush format.

As a result, claims 1-20 remain pending for examination, with claims 1, 5, 9, 11, 12, and 18 being independent claims.

Replacement drawings (FIGS. 1-8, 8 sheets) are filed herewith to replace the original drawings.

No new matter has been added with any of the amendments or replacement drawings.

Double Patenting Rejection

Claims 1-20 are provisionally rejected under the non-statutory doctrine of obviousness-type double patenting over claims 1-32 of co-pending U.S. Patent Application Serial No. 10/712,674 (hereinafter "the '674 application").

Applicants disagree that claims 1-20 are patentably indistinct from claims 1-32 of the '674 application. Nonetheless, Applicants submit herewith, without acceding to the validity or substance of the rejection, a Terminal Disclaimer in compliance with 37 C.F.R. 1.321(c) only to facilitate prosecution of this application. Therefore, the judicially-created rejection has been rendered moot.

Accordingly, reconsideration and withdrawal of the rejection under the doctrine of obviousness-type double patenting is requested.

Rejections Under 35 U.S.C. § 103

Claims 1-20 are rejected under 35 U.S.C. § 103(a) as would have been obvious over the teaching of Sato in European Patent No. EP 1 172 145 B1 (hereinafter "Sato") in view of the teaching of Briggs in U.S. Patent No. 2,535,035 (hereinafter "Briggs") and the teaching of Bianchi *et al.* in U.S. Patent No. 4,830,732 (hereinafter "Bianchi *et al.*").

Applicants disagree that the respective subject matter of each of claims 1-20 would have been obvious over the teaching of Sato in view of the teachings of Briggs and Bianchi *et al.* The rejection is improper because none of the references teaches or suggests each and every claimed element, alone or in combination. Indeed, the alleged *prima facie* case of obviousness is also improper because one skilled in the art would not have had any reasonable expectation that the alleged combination would be successful.

Sato teaches an electrodeionization apparatus and its method of operation and, in particular, teaches limiting the diffusion of silica from concentrating compartments of the device to produce product water with low silica concentration. The disclosed apparatus and method involves limiting the concentration of silica in water leaving from the concentrating compartment of the device to less than 100 ppb, preferably, to less than 70 ppb. (Sato at paragraphs [0006] to [0010].)

Briggs teaches a method of electrolytic water softening and pH adjustment and, in particular, teaches a method and a means of reducing the amount of waste solution involved in electrolytic water softening and, at the same time, serves to increase the efficiency of the electrolytic influence. (Briggs at column 1, lines 6 *et seq.*) The disclosed electrolytic cell has a cathode chamber 3 and an anode portion separated therefrom by a porous diaphragm 5. A partition 6 divides the anode portion into two sections; anode section 4 and anodic chamber 24. (Briggs at column 2, lines 10 *et seq.* and at FIG. 1.) During operation of the electrolytic cell, raw, hardness-containing water is introduced into the cathode chamber 3; the majority of the water flows through the cathode chamber 3 where it becomes alkalized due to electrolytic influence and, consequently, considerable quantities of the hardness components therein can precipitate. (Briggs at column 2, lines 10 *et seq.*) The precipitate-containing water flowing out of the cathode chamber 3 is directed to a settling tank 8 wherein the precipitate is removed. Overflow from the tank 8 is passed through a sand filter 9 for clarification before being directed

into the anodic chamber 24 of the anode portion where the pH of the water is reduced to a desired level before being discharged as a finished water product through line 12. (Briggs at column 2, lines 23 *et seq.*) An alkalizing agent, such as milk of lime, is added to the solution recirculating to and from anode section 4 thereby forming a precipitate that is removed after setting in a tank 15. An amount of solution can be discarded through an overflow line 18 from tank 15. Raw water can be introduced into the recirculating solution as make-up water through a control device 2. If an alkalizing agent is not utilized, a portion of the recirculating acidic solution can be removed from the tank 15 through the overflow line 18. An assembly of two compartment cells may be utilized in a similar manner. (Briggs at column 3, lines 61 *et seq.* and at FIG. 3.)

Bianchi *et al.* disclose an electrochemical deoxygenation process for corrosion control in deionized water with a membrane electrolyzer. (Bianchi *et al.* at Abstract.) The electrolyzer has electrolytic cells 1 defined by end-plates B. The cell 1 is separated into an anode compartment and a cathode compartment by a membrane M. The anode compartment has an anode A which supports the membrane M. (Bianchi *et al.* at column 3, lines 1 *et seq.* with reference to the schematic illustration of FIG. 1) The cathode compartment comprises a cathode C and a distributor D, which presses the cathode C against the membrane M. (Bianchi *et al.* at column 3, lines 27 *et seq.*) During operation, deionized water is fed into the cathode compartment and a cathodic reaction reduces oxygen dissolved in the water. (Bianchi *et al.* at column 4, lines 1 *et seq.*) A 70 % reduction of the oxygen content of a deionized water was achieved. (Bianchi *et al.* at Example 1.)

The subject matter of independent claim 1 would not have been obvious over the teaching of Sato in view of the teachings of Briggs and Bianchi *et al.* because none of the references teaches a method of purifying water comprising passing a first water stream through a depleting compartment of an electrochemical device to produce a second water stream having an LSI (Langelier Saturation Index) of less than about 0, and passing the second water stream through a cathode compartment of the electrochemical device to produce a third water stream that is less corrosive than the first water stream and having an LSI of less than about 0.

The subject matter of independent claim 5 would not have been obvious over the teaching of Sato in view of the teachings of Briggs and Bianchi *et al.* because none of the references teaches a method of providing potable water comprising passing a first water stream through a

cathode compartment of an electrochemical device to produce a second water stream, and passing the second water stream through a depleting compartment of the electrochemical device to produce a third water stream having an LSI less than about 0, wherein the third water stream is less corrosive than the first water stream.

The subject matter of independent claim 9 would not have been obvious over the teaching of Sato in view of the teachings of Briggs and Bianchi *et al.* because none of the references teaches a method of retaining a residual chlorine level in water comprising removing greater than 90 % of active chlorine from a first water stream, passing the water stream through a depleting compartment of an electrochemical device, removing a portion of any ions dissolved in the water stream, introducing the water stream to a loop that includes a storage vessel, and introducing active chlorine in a second water stream into the loop at a rate adequate to maintain an effective average chlorine concentration in the loop.

The subject matter of independent claim 11 would not have been obvious over the teaching of Sato in view of the teachings of Briggs and Bianchi *et al.* because none of the references teaches a method of selectively retaining ions in a water supply comprising passing a feed water that comprises monovalent and divalent ions through a depleting compartment of an electrochemical device, removing at least 30 % of the divalent ions from the feed water and retaining at least about 80 % of a species selected from the group consisting of silica, boron, and fluoride to produce a treated water, and supplying the treated water for household consumption.

The subject matter of independent claim 12 would not have been obvious over the teaching of Sato in view of the teachings of Briggs and Bianchi *et al.* because none of the references teaches a method of producing purified water comprising passing a water stream through a depleting compartment of an electrochemical device, and adjusting a voltage applied to the electrochemical device to control the current passing through the electrochemical device at a level adequate to remove greater than about 25 % of any hardness ions in the water stream and inadequate to remove greater than about 10 % of any fluoride or silica species from the water stream.

The subject matter of independent claim 18 would not have been obvious over the teaching of Sato in view of the teachings of Briggs and Bianchi *et al.* because none of the references teaches a method comprising passing a feed water through a bed of ion exchange material to remove greater than 30 % of any hardness ions from the feed water to produce a

softened water, supplying the softened water for household consumption, and discharging a concentrated solution comprising calcium, wherein the sum of the ionic content of the softened water and the ionic content of the concentrated solution is no greater than the total ionic content supplied by the feed water.

A person of ordinary skill in the art would not have turned to the teaching of Bianchi *et al.* to modify the teaching of Briggs or Sato. As noted above, Bianchi *et al.* seeks to remove dissolved oxygen from a deionized water stream by regulating an applied current and/or potential to an electrolyzer to a level that promotes reaction of the dissolved oxygen to produce water. No rational explanation has been provided that supports a motivation to incorporate the teaching of Bianchi *et al.* that is directed to reactively removing dissolved oxygen by controlling an applied current through an electrolyzer. Indeed, the device disclosed by Bianchi *et al.* operates under principles that significantly differ from the operating principles of the device disclosed by Sato or even the device disclosed by Briggs. Thus, a person skilled in the art would not have been motivated to modify Sato's allegedly typical electrodeionization device, or Briggs' electrolytic water softening device, to remove dissolved oxygen by controlling applied current.

To be sure, a person skilled in the art would not have combined the teaching of Briggs with the teaching of Bianchi *et al.* because the reactions disclosed in the cathode compartment of Briggs' device differ from those in the cathode compartment of the Bianchi *et al.* device. That is, Briggs teaches electrolytically raising the pH of the water in the cathode compartment, presumably by generating hydroxyl species or by promoting removal or transport of hydrogen ions from the cathode compartment into the anode compartment, whereas Bianchi *et al.* teaches electrolytically generating hydrogen ions, which can react with dissolved oxygen. Thus, one skilled in the art would have recognized that applying the techniques disclosed by Briggs would render the device disclosed by Bianchi *et al.* entirely inoperable. Conversely, one skilled in the art would also have recognized that applying the techniques disclosed by Bianchi *et al.* would render the device disclosed by Briggs inoperable.

Therefore, the alleged *prima facie* case of obviousness is improper because, even if the teachings of the references could have been combined, one skilled in the art would not have had any reasonable expectation that the combination would have been successful. Further, the *prima facie* case of obviousness is also improper because the alleged combination would have failed to recite each and every limitation recited in each of independent claims 1, 5, 9, 11, 12, and 18.

For at least these reasons, the subject matter of each of dependent claims 2-4, 6-8, 10, 13-17, 19, and 20 would also not have been obvious over the teaching of Sato in view of the teachings of Briggs and Bianchi *et al.*

Accordingly, reconsideration and withdrawal of the rejection of claims 1-20 under 35 U.S.C. § 103 is respectfully requested.

Conclusion

In view of the foregoing Amendments and Remarks, this application is in condition for allowance; a notice to this effect is respectfully requested. If the examiner believes, after this amendment, that the application is not in condition for allowance, the examiner is requested to call Applicants' attorney at the telephone number listed below.

If this Response is not considered timely filed and if a request for an extension of time is otherwise absent, Applicants hereby request any necessary extension of time. If there is a fee occasioned by this Response, including an extension fee that is not covered by an enclosed check, please charge any deficiency to Deposit Account No. 50/2762.

Respectfully submitted,
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